Electronic Version
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Claims

[c1] An integrated circuit, comprising:
a plurality of data transmitters including a plurality of default data transmitters and at least one redundancy data transmitter; and
a plurality of connection elements having a first, low impedance connecting state, and having a second, high impedance, disconnecting state, at least a first connection element of said plurality of connection elements being operable to connect and disconnect a first default data transmitter of said plurality of default data transmitters from a first output signal line, said first connection element further being operable to connect and disconnect said redundancy data transmitter from said first output signal line.

[c2] The integrated circuit of claim 1 wherein at least a second connection element of said plurality of connection elements is operable to connect and disconnect said first default data transmitter from a first input signal line, said second connection element further being operable to connect and disconnect said redundancy data transmitter from said second input signal line.

[c3] The integrated circuit of claim 1 wherein each of said connection elements includes a fuse, wherein said fuse of said first connection element connects said first default data transmitter to said first output signal line when a first fuse of said first connection element is in said a low impedance state and disconnects said first default data transmitter from said first output signal line when said first fuse is in said a high impedance state.

[c4] The integrated circuit of claim 3 wherein each of said connection elements further includes an antifuse fuse, wherein a first said antifuse of said first connection element connects said redundancy data transmitter to said first output signal line when said first antifuse is in said a low impedance state and disconnects said redundancy data transmitter from said first output signal line when said first antifuse is in said a high impedance state.

[c5] The integrated circuit of claim 2 wherein said first connection element includes a first fuse and said second connection element includes a second fuse, wherein said first connection element connects said first default data transmitter to said first output signal line when said first fuse is in a low impedance state and disconnects said first default data transmitter from said first output signal line when said first fuse is in a high impedance state and

wherein said fuse of said second connection element connects said first default data transmitter to said first input signal line when said second fuse is in a said low impedance state and disconnects said first default data transmitter from said first input signal line when said second fuse is in a said high impedance state.

[c6] The integrated circuit of claim 5 wherein said first connection element further includes a first antifuse and said second connection element further includes a second antifuse, wherein said first connection element connects said redundancy data transmitter to said first output signal line when said first antifuse is in a low impedance state and disconnects said redundancy data transmitter from said first output signal line when said first antifuse is in a high impedance state and said antifuse of said second connection element connects said redundancy data transmitter to said first input signal line when said second fuse is in said a low impedance state and disconnects said redundancy data transmitter from said first input signal line when said second fuse is in said a high impedance state.

[c7] The integrated circuit of claim 1 wherein each of said plurality of connection elements includes a plurality of micro-electromechanical (MEM) switches, wherein a first MEM switch of said first connection element connects

and disconnects said first default data transmitter to said first output signal line.

[c8] The integrated circuit of claim 7 wherein a second MEM switch of said first connection element connects and disconnects said redundancy data transmitter to said first output signal line

[c9] The integrated circuit of claim 8 wherein a first MEM switch of a second connection element of said plurality of connection elements connects and disconnects said first default data transmitter to said first input signal line and second MEM switch of said second connection element connects and disconnects said redundancy data transmitter to said first input signal line.

[c10] The integrated circuit of claim 7 wherein said plurality of MEM switches include MEM switches of the type having a signal pad restrained by a plurality of hinge brackets for movement in a substantially vertical direction in response to electrostatic force to switch between a connecting state and a disconnecting state.

[c11] The integrated circuit of claim 2 wherein said each of said default data transmitters provides a pair of differential signal outputs and receives a pair of differential signal inputs, such that said first output signal line includes

a pair of differential signal conductors for receiving said differential signal outputs and said first input signal line includes a pair of differential signal conductors for providing said differential signal inputs.

[c12] The integrated circuit of claim 1 wherein said plurality of data transmitters are operable at signal switching frequencies above about 500 MHz and said connection elements present said first, low impedance connecting state at frequencies including said signal switching frequencies above about 500 MHz.

[c13] The integrated circuit of claim 112 further comprising a plurality of data receivers operable at signal switching frequencies above about 500 MHz, said plurality of data receivers including a plurality of default data receivers and at least one redundancy data receiver,
wherein at least a second connection element of said plurality of connection elements is operable to connect and disconnect a first default data receiver of said plurality of default data receivers from a first input signal line, said second connection element further being operable to connect and disconnect said redundancy data receiver from said first input signal line.

[c14] An integrated circuit, comprising:
a plurality of data receivers operable at signal switching

frequencies above about 500 MHz, said plurality of data receivers including a plurality of default data receivers and at least one redundancy data receiver; and
a plurality of connection elements having a first, low impedance connecting state at signal switching frequencies above about 500 MHz, and having a second, high impedance, disconnecting state, at least a first connection element of said plurality of connection elements being operable to connect and disconnect a first default data receiver of said plurality of default data receivers from a first output signal line, said first connection element further being operable to connect and disconnect said redundancy data receiver from said first output signal line.

[c15] The integrated circuit of claim 14 wherein said plurality of data receivers are operable at signal switching frequencies above about 500 MHz and said connection elements present said first, low impedance connecting state at frequencies including said signal switching frequencies above about 500 MHz.

[c16] The integrated circuit of claim 14 wherein each of said plurality of connection elements includes a fuse, wherein a first default data receiver of said plurality of default data receivers is connected and disconnected to said first output signal line by a fuse of a first connection element

of said plurality of connection elements.

[c17] The integrated circuit of claim 14 wherein each of said plurality of connection elements includes a plurality of micro-electromechanical (MEM) switches, wherein a first default data receiver of said plurality of default data receivers is connected and disconnected to said first output signal line by a first MEM switch of a first connection element of said plurality of connection elements.

[c18] A method of performing redundancy replacement for an integrated circuit including a plurality of data transmitters operable at signal switching frequencies above about 500 MHz, comprising:
providing a plurality of data transmitters of said integrated circuit including a plurality of default data transmitters and at least one redundancy data transmitter;
providing a plurality of input signal lines and a plurality of output signal lines;
providing a plurality of connection elements on said integrated circuit having a low impedance connecting state at signal switching frequencies above about 500 MHz, and having a high impedance, disconnecting state;
connecting a first default data transmitter of said plurality of data transmitters through a first connection element of said plurality of connection elements to a first input signal line of said plurality of input signal lines and

connecting said first default data transmitter through a second connection element of said plurality of connection elements to a first output signal line of said plurality of output signal lines;

disconnecting said first default data transmitter from said first input signal line and said first output signal line by altering said first and second connection elements to present said high impedance, disconnecting state to said first default data transmitter; and

connecting said redundancy data transmitter to said first input signal line and to first output signal line by altering said first and said second connection elements to present said low impedance connecting state to said redundancy data transmitter.

[c19] The method of claim 18 further comprising

providing a plurality of data receivers of said integrated circuit including a plurality of default data receivers and at least one redundancy data receiver, wherein said data receivers and said data transmitters are operable at signal switching frequencies above about 500 MHz;

connecting a first default data receiver of said plurality of data receivers through a first connection element of said plurality of connection elements to a first input signal line of said plurality of input signal lines and connecting said first default data receiver through a second

connection element of said plurality of connection elements to a first output signal line of said plurality of output signal lines;

disconnecting said first default data receiver from said first input signal line and said first output signal line by altering said first and second connection elements to present said high impedance, disconnecting state to said first default data receiver; and

connecting said redundancy data receiver to said first input signal line and to first output signal line by altering said first and said second connection elements to present said low impedance connecting state to said redundancy data receiver, wherein said connection elements present said low impedance connecting state at frequencies including said signal switching frequencies above about 500 MHz.

[c20] The method of claim 19 wherein each of said plurality of connection elements includes a plurality of micro-electromechanical (MEM) switches, wherein said first default data transmitter is connected and disconnected to said first output signal line through a first MEM switch of said first connection element and is connected and disconnected to said first input signal line through a first MEM switch of said second connection element.